

## Claims

What is claimed is:

1. A downhole pressure compensation system, comprising:
  - a seal housing disposed in a downhole tool;
  - a dynamic seal disposed on the seal housing, wherein the dynamic seal seals around a part that is allowed to move relative to the seal housing; and
  - a flexible membrane disposed in a sidewall of the seal housing proximate the dynamic seal.
2. The downhole pressure compensation system of claim 1, wherein the flexible membrane is in fluid communication with a fluid inside the seal housing via a fluid passage.
3. The downhole pressure compensation system of claim 1, further comprising a second pressure compensation system comprising a piston disposed in a cylinder.
4. The downhole pressure compensation system of claim 1, further comprising a second pressure compensation system comprising a bladder.
5. The downhole pressure compensation system of claim 1, wherein the downhole tool is a mud pulse telemetry pulse generator.
6. The downhole pressure compensation system of claim 1, wherein the flexible membrane comprises a frustoconical section of the seal housing.
7. The downhole pressure compensation system of claim 1, wherein the flexible membrane is constructed of an elastomer.
8. The downhole pressure compensation system of claim 1, wherein the flexible membrane is constructed of a metal.

9. A method of compensating for a mud pressure signal, comprising:
  - generating a pressure signal in a mud flow rate; and
  - transmitting the pressure to the inside of a seal housing through a flexible membrane disposed on a seal housing proximate a dynamic seal.